

# British Medical Journal.

SATURDAY, MARCH 14TH, 1925.

## HEREDITY AND TUBERCULOSIS.

WHETHER an hereditary predisposition to fall a victim to clinically manifest tuberculosis is an etiological factor of importance has long been a vexed question. In recent times Professor Karl Pearson and his collaborators have been the chief exponents of the opinion that such a predisposition is both heritable and of importance. Put briefly, these workers have shown that the incidence of overt tuberculosis upon the ascendants of persons themselves diseased is greater than upon the ancestors of the same degree of kinship of normal persons. Upon certain assumptions it was possible to measure the intensity of the association between the liability to disease of the paired relations, and the resulting numerical value was of the same order of magnitude as that obtaining with respect to characters, such as stature, the statistical treatment of which was easier. It was objected to these researches that the resemblance between parent and child brought out might be interpreted as a measure, not of the force of inheritance, but of the force of familial infection. In rebuttal of this, it was shown that the numerical measure of association between husband and wife, with respect to the having or not having manifest tuberculosis, was much smaller than that connecting parent and child, although the opportunities for infection were as great or greater. To this it was retorted that the age factor in infection was so great that a study of husbands and wives did not really amount to a valid control.

There the matter has stood in this country, the parties to the dispute remaining (as usual) of their original opinions. The greater facilities offered by America for the compilation of some kinds of statistics have been exploited to obtain further evidence. Two recent statistical contributions from America, reaching wholly different conclusions, may be noted. The first is Dr. Raymond Pearl's study of constitution and tuberculosis, originally contributed to a symposium but forming a chapter of his new book *Studies in Human Biology*.<sup>1</sup> The other is a paper by Mr. Godias J. Drolet, entitled "The inheritance factor in tuberculosis," published in the *American Review of Tuberculosis* for November, 1924 (vol. x, p. 280).

Dr. Pearl is engaged in a large-scale investigation which is not yet complete, and is very careful to abstain from positive statements; but an illustration of his method may be given. "Suppose," he asks, "we stopped the first man or woman we chanced to meet on the street and ascertained by appropriate methods whether that person was or was not tuberculous, and at the same time made detailed inquiries as to his or her blood relatives. Should we be justified in laying a wager, if the individual proves to be tuberculous, that a larger percentage of his relatives will be also tuberculous than if he himself were non-tuberculous, and what, if any, odds could we give in

such a wager?" To get a first approximation to the answer Dr. Pearl studied 57 persons—38 tuberculous, 19 not tuberculous—the family histories of whom, covering 5,000 blood relatives, had been traced. He tabulated the proportions of the relatives in each generation who were or were not tuberculous. For instance, the parental generation (parents, uncles, aunts) of the non-tuberculous subjects included 763 individuals, of whom 14 (1.8 per cent.) were tuberculous; the parental generation of the tuberculous persons included 472 individuals, of whom 42 (8.9 per cent.) were tuberculous. Taking all generations together, 7 per cent. of the blood relatives of the tuberculous and 1.2 per cent. of the blood relatives of the non-tuberculous were themselves affected. Dr. Pearl then considered the opportunities of infection, dividing his data into (a) those known to have been in close contact with another case before developing the disease, (b) those not so known. He remarks: "As the amount of tuberculosis in the direct ancestry increases, the amount of tuberculosis in the offspring increases also, but the disturbing fact is that the rate of close contact with open cases increases enormously more rapidly than does the rate of incidence. In short, we find that where one or both parents are actively tuberculous, practically all the offspring who subsequently develop tuberculosis have been in close, intimate contact with another active case, usually, of course, that of the parent or parents. Instantly those who oppose the view that constitution plays any part in the etiology of disease, and particularly of tuberculosis, will assert that this explains the whole matter—that if the children had not been in contact with the open, active cases, they would not have broken down with the disease. Just possibly they may be right. The case, however, is not simple. Our figures equally show that where one or both of the parents were actually tuberculous, *virtually three-fourths of the non-tuberculous offspring have been in just as close contact with active open cases as their brothers and sisters who unfortunately developed the disease.* [Italics in original.] And it must not be supposed that this high contact percentage can be explained by asserting that the non-tuberculous children are all young children who will subsequently all develop the disease. This is not true. Their average age is significantly the same as that of the tuberculous offspring." He strongly emphasizes the need for multiplication of such data, and abstains from drawing conclusions, going no further than to suggest that the data are congruent with the view that familial infection is a real factor but does not wholly explain the increased incidence of tuberculosis in the direct ascending line of the tuberculous.

Dr. Pearl's paper is, we think, a good example of serious statistical field research. We are afraid this cannot be said without qualification of Mr. Drolet's essay. Mr. Drolet suffers from the weakness of the legendary sailor's parrot: he talks too much, as his first sentences sufficiently demonstrate. "The theory that tuberculosis is inheritable dies hard. As the original protagonists of that idea have been driven, because of lack of evidence, from a belief in the actual transmission of the disease from mother to child, they have retreated into the position that, if the disease itself be not inherited, then at least a predisposition to it is transmitted." The position which the "original protagonists" "have retreated into" is the grave, which one of them has occupied for more than a thousand years. But it is to be hoped that Mr. Drolet's friends will persuade him to eschew eloquence, and temporarily abstain from speculating on "Nature's powers of

<sup>1</sup> Baltimore, 1924.

resistance and recovery," so that he may have more time to devote to statistical analysis, since he puts forward some data which may be worth careful study.

Mr. Drolet has, apparently, inquired into the family histories of a large number of persons suffering or not suffering from clinical tuberculosis—5,998 adults and 1,431 children. Of the adults, 3,759 were suffering from tuberculosis, 2,239 were not. In the tuberculous series a parental history of tuberculosis was obtained in 432 instances, or 11.5 per cent. of the cases; in the non-tuberculous series positive histories were obtained in 321 instances, or 14.3 per cent. of the cases. Of the 1,431 children, 244 were tuberculous, 1,187 not tuberculous. The percentages of positive family histories work out as 55.7 for the tuberculous and 60.3 for the non-tuberculous. Mr. Drolet has himself set out the data as percentages of the offspring of tuberculous and non-tuberculous parents, reaching the result that 57 per cent. of the adult offspring of tuberculous and 63 per cent. of the adult offspring of non-tuberculous parents are tuberculous, the corresponding figures for children being 13 per cent. and 22 per cent. As, however, the sampling is of the filial, not of the parental, generation, this method of presentation is, we think, erroneous; knowledge of the parents was obtained through the children; but the results, when correctly stated, are so curious that they deserved fuller analysis. We do not think it has been suggested before that the children of the tuberculous are less likely to develop the clinical disease than the children of the non-tuberculous, or, to use Dr. Pearl's analogy, that we might lay odds that the proportion of tuberculous ascendants in the line of a person suffering from tuberculosis is smaller than in the line of a person not suffering from tuberculosis. Mr. Drolet has, indeed, a theory to account for this. He finds that the prognosis in sanatorium treatment of patients with a history of tuberculosis in the family is rather better than that of those without such a history, and holds that "Nature" works by the immunizing of the descendants of the tuberculous. He is, we think, mistaken in supposing that Professor Pearson "felt the existence of some such possibility"; we do not know, of course, but we suspect that in the passage cited from Professor Pearson that investigator may have been referring to an English writer of some note in his day—the late Charles Darwin. But we certainly think that a fuller analysis of Mr. Drolet's material should be prepared; because statistics look odd is no reason for rejecting them, but a very good reason for scrutinizing them closely. We suspect—basing ourselves on experience of the difficulty of securing accurate family histories of disease—that the specifications of both numbers and state of health in the parental generations are incomplete, and that Mr. Drolet is dealing with much less adequate material than Dr. Pearl. When this important point has been cleared up will be time enough to discuss Mr. Drolet's theory of hereditary immunization.

We have thought it worth while to refer to these papers at some length because there is a fairly obvious tendency in recent literature to ventilate very far-reaching theories of etiology in tuberculosis without producing any evidence which will bear critical evaluation. Some very distinguished investigators, such as Professor Calmette, are not wholly free from reproach in this matter, and unless the tendency is checked knowledge of etiology will not be increased, but the very modest existing standard of medico-statistical accuracy will be lowered. As matters now stand, the caution of Dr. Pearl rather than the speculative ingenuity of Mr. Drolet should be the guide of workers in this field.

## INFANTILE PARALYSIS.

THE disease described by Medin and Heine, and long known as infantile paralysis, has become more and more important during the last thirty years. As our knowledge of its incidence and pathology has increased the descriptive inadequacy of its title has become evident. The original name became obviously inappropriate as soon as it was recognized that the disease sometimes affected adults, whereupon the pathological name of anterior poliomyelitis was substituted. Later still—when it was established that in some of the cases observed during epidemics lesions were found in other parts of the central nervous system, and symptoms were recorded which betokened affections of the cerebrum—it became necessary to make its name more comprehensive, and writers such as R. W. Lovett adopted the cumbersome title of anterior poliomyelo-encephalitis. Until 1894 no extensive epidemic of the disease had been accurately recorded, but in that year Caverly reported 132 cases in the course of a few months in the New England State of Vermont. Since then there have been thirteen epidemics of sufficient importance to be tabulated by Jones and Lovett in their recent work on orthopaedic surgery, culminating in the really appalling outbreak of 1916 in the City and State of New York, in which 13,223 persons were attacked, and the death rate was over 25 per cent. These thirteen epidemics comprised over 18,000 cases, with an average death rate of 20.7 per cent. Although complete recovery occurs in perhaps one-fourth of the survivors, the remainder are the victims of lifelong disability in a greater or less degree. The infectivity of the disease has been established beyond doubt, although the micro-organism concerned is a filter-passer which has not been isolated. In this country the disease is notifiable, but as it is almost certainly propagated by unsuspected "carriers" attempts to control it by isolation are not very likely to be successful.

No acceptable explanation has yet been offered of the localization of epidemics of anterior poliomyelo-encephalitis, and no good reason can be assigned for their prevalence in the north-eastern States of the Union. Besides those localities, the Scandinavian peninsula and Central Germany have been sufferers. No epidemic of importance has been recorded in Great Britain, Ireland, or France, yet the frequency of sporadic cases and small epidemics in these countries shows that the conditions in them are not prohibitive, and that we must not count on the continuance of our comparative immunity. Therefore we should set our house in order and be prepared for eventualities. The cripples' organization which started in Shropshire, and which is spreading all over the country, should provide the cadres for mobilization in case of attack by a formidable epidemic. In London the County Council has a scheme on foot for the provision of hospital treatment for cases occurring within its area.

Enough has been said to show the gravity of the problems presented by this disease and to justify Mr. E. W. Hey Groves in choosing its treatment as the subject for his address to the Dorset Medical Society, which appears in another part of this issue. The principles, and the application of them which he so strenuously advocates, are accepted by all orthopaedic surgeons and those physicians and other practitioners whose lot it has been to acquire adequate acquaintance with this disease. For many years orthopaedic surgeons have had the satisfaction of correcting paralytic deformities by various means, including the application of instruments, and of enabling cripples

who may have appeared doomed to hopeless inactivity to stand erect upon their feet and to move about. But it has been seldom that the surgeon saw a case in its early stage, or even before contractures and secondary joint and bone distortions had supervened. Some physicians, notably the late Dr. F. E. Batten, utilized their opportunities of treating cases in their early stages by inculcating the necessity of prevention of deformity by the use of celluloid or other retentive appliances; but until recent years the early treatment has been too often, on the one hand, harmfully meddling in its attempts at stimulation, or, on the other hand, negligent of the means of preventing secondary changes in bones and contractures of joints.

The disease, Mr. Hey Groves reminds us, has for convenience been described as consisting of three stages, but, strictly speaking, there are only two—namely, the initial inflammatory stage, and the longer stage during which recovery is taking place in those nerve cells which have not been irretrievably damaged. In the so-called third stage no active morbid process is going on, but the effects of previous active disease remain permanently. Everyone with any experience is agreed that in the first two stages complete physiological rest is imperatively called for. In the less severe cases—in which, for instance, one leg and foot only are obviously affected—the first stage may be so transient as to escape notice by untrained observers. Many parents in the out-patient room have declared that there was no sign of malaise or fever, but that the child “went to bed well and woke up paralysed.” Such was the history given in 19 out of a series of 115 cases recorded in a paper read by Mr. Muirhead Little at the Annual Meeting of the British Medical Association at Ipswich in 1900,<sup>1</sup> while in many others no history of constitutional disturbance could be elicited. This experience suggests that although early recognition and treatment is most desirable, there will often be practical difficulties in their attainment. It is therefore all the more necessary that every practitioner should bear in mind the importance of watching carefully any symptoms of malaise occurring in children during the third quarter of the year, in which season the majority of attacks occur, and of prescribing complete rest as a precautionary measure. As soon as the diagnosis of poliomyelitis is made, the measures of restraint specified by Mr. Hey Groves and other writers must be employed. Later on the specialist will probably be called upon to perform such operations as may be necessary to enable the patient to make the best use of so much muscular power as remains to him and to minimize the need of mechanical supports, which, however, can never be entirely dispensed with in severe cases. But neither the general practitioner nor the specialist can do his part of the work unless the necessary clinics and hospitals are provided. Early notification in the active stages of the malady ought to connote the provision of the necessary beds in isolation hospitals or wards of hospitals, while for the crippled stage it is most desirable that the hands of the Central Committee for the Care of Cripples and of the administrative authorities responsible for orthopaedic and cripples’ hospitals should be strengthened by the provision of ample funds by the charitable public, in which should be included not only the rich, but also those agencies which enable the working man to take his part in charitable work.

Mr. Hey Groves concludes his address with a slashing attack upon British hospitals in general and the voluntary hospitals in particular. There is, he

says, “striking evidence of the failure of the voluntary system.” Slashing attacks are a sign of vigour, and they commonly have results—either the destruction of an untenable position or the impalement of the attacker. Mr. Hey Groves’s attack is based upon his failure to get what he wants for his patients. He wants special institutions, “open-air hospitals,” for those who have passed the acute stage of infantile paralysis, where they can be treated for years. Proof that his demand is justified is to be found in his own words: “Such open-air school hospitals have been springing up all over the country, chiefly as the result of individual philanthropy and enterprise.” Strangely enough, he confesses that he is getting the thing he wants, and partly through the very voluntary system he condemns so bluntly. Much of his condemnation is based upon a misconception common to many writers and speakers. There is a hospital system in this country—a patchy mosaic established by statute under various authorities. There is no voluntary “system,” though there are many voluntary hospitals—the expression of “individual philanthropy and enterprise” (to use Mr. Hey Groves’s words). At diverse times and in various places men and women, moved by the spirit of the Good Samaritan, have given of their skill, time, and substance for their stricken neighbours. The appeal has arisen in many different ways, but it has always been swiftly answered. The fever-stricken, the leper, the outcast, the infirm, the woman in child-bed, sick children, and the child paralytic have all made their piteous appeal, and the generosity of the philanthropist and doctor has always and quickly answered it. The fact that now in this country the beds in “State” hospitals vastly outnumber those in “voluntary” hospitals is in itself proof of the success of the voluntary principle; it means that “individual philanthropy and enterprise” has compelled the sluggish mass of the community to follow suit. That Mr. Hey Groves has not all the open-air school hospitals he wants shows chiefly that the local education authorities are not carrying out duties which are properly theirs. It is evident from this that the mass movement has not yet been drawn into the wake of the individual pioneers. But perhaps he is writing of Bristol only, for there are parts of the country where the advance has been much greater.

A phrase in Mr. Hey Groves’s paper suggests that he is not familiar with the policy of the British Medical Association for the co-ordination of hospital services. It has just been published in a separate pamphlet,<sup>2</sup> and is worth study. Perchance through that scheme we shall be able to combine the swift response of voluntary or independent enterprise with the mass of communal action, to the general advantage.

THE fifth British Congress of Obstetrics and Gynaecology will be held at the house of the Royal Society of Medicine, 1, Wimpole Street, London, W., from April 22nd to 24th inclusive. The president is Dr. H. Russell Andrews, and the honorary secretaries Mr. Clifford White and Dr. J. D. Barris. The subjects to be treated include the prognosis and treatment of puerperal sepsis, and endometrioma. The members of the Congress will be entertained to lunch by the Section of Obstetrics and Gynaecology of the Royal Society of Medicine; an evening reception and a dinner will also be held. The detailed programme will be issued at the beginning of April.

<sup>1</sup> BRITISH MEDICAL JOURNAL, 1900, vol. ii, p. 580.

<sup>2</sup> Policy Affecting Hospitals. British Medical Association, 429 Strand, 1925. Pp. 27. Price 3d.

## THE PRESCRIPTION OF MANGANESE.

LITTLE prominence has been given to compounds of manganese in works on materia medica, and no extensive therapeutic use has been made in this country of pharmaceutical products from it. Its compounds fall into two classes: one is represented by salts of the type of manganese sulphate or chloride; the other comprises the group of permanganates, and includes the higher oxides, which have a more pronounced character as vehicles of chemically active oxygen than of medicinal manganese. Manganese sulphate has appeared in a list of purgatives, the dose ranging from 30 to 60 grains; in that character a similarity is evinced to its crystalline isomorph magnesium sulphate. It has also been accounted a tonic when given in doses of 1 to 5 grains; in this respect it bears comparison with ferrous sulphate, with which it is also isomorphous. Manganese hypophosphite is an ingredient of compound syrup of hypophosphites (*B.P.C.*). The expectation that manganese would be rendered more readily absorbable when combined with protein has led to the preparation of a nucleinate; a colloidal solution of the dioxide has also been prepared for medicinal use, and manganese butyrate has been used for intramuscular injection. The uses of potassium permanganate are very well known. It has been generally regarded as having only a local action. Since, however, the view is now established that manganese plays an important part in metabolism, it may not suffice to assume that the beneficial effects of certain modes of treatment by permanganate can be attributed solely to local action; consequences of absorption and assimilation must also receive attention. The interest—some evidence of which is afforded by the letters published elsewhere this week—aroused by Dr. H. W. Nott's paper (published last week, p. 443) on the effects of rectal injection of permanganate accompanied by administration of products of the thyroid gland, will stimulate the desire for a preparation to be given by the mouth which shall produce like effects. It will be helpful, in following this aim, to have a careful appreciation of the conditions of the treatment adopted by Dr. Nott. When permanganate is injected into the rectum three actions can be recognized: first, a vigorous oxidation acting selectively on those matters most susceptible of oxidation with which it comes in contact; secondly, the production of manganese dioxide or even a lower oxide in a condition capable of being absorbed; and thirdly, the formation of caustic alkali. Three grains of potassium permanganate produce a grain of caustic potash—an action of doubtful advantage, for certain mucous surfaces are highly sensitive to caustic alkali, even when it is much diluted. This may perhaps account for the mucous casts of the bowel passed by some of the patients treated by rectal injection. Since the manganese salts belonging to the first mentioned group have no oxidizing power, it is evident that none of them could supply the oxidizing activity of permanganate. Permanganate itself undergoes immediate decomposition when given by the mouth. It is, however, not improbable that both the other activities of permanganate, provisionally regarded as desirable, may be realized in adequate degree by the administration of manganese dioxide by the mouth, especially if it be given in a form that would pass to the bowel with least intermediate change. Manganese dioxide possesses an oxidizing power which is less vigorous than that of permanganate, but it is nevertheless effective on matters susceptible of oxidation. Camescasse, whose successful use of manganese in debilitated children was noted in the leading article published last week (p. 468), prescribed manganese binoxide in cachets or compressed tablets given by the mouth. His formula in English equivalents is manganese dioxide gr. xiv, magnesium carbonate gr. xx, magnesium peroxide gr. v, diastase gr. i, gum, sugar, essences q.s. These

quantities yield fourteen doses, dispensed as compressed tablets, each containing a grain of manganese dioxide. English authorities give variously, some 5 to 10 grains, and others 10 to 30 grains, as the permissible dose. Manganese dioxide is not included in the *British Pharmacopoeia* as a medicine; it appears there only as a test reagent. There are two kinds: One is natural; it occurs chiefly in the form of pyrolusite, consisting of steel-grey prismatic crystals, and in the amorphous mineral psilomelane, a black powder. The natural product contains more or less iron oxide, calcium carbonate, and earthy matter. The other kind is obtained by precipitating a solution of manganese by means of ammonia and hydrogen peroxide and repeated washing. Both are described in the *Pharmaceutical Codex*, but only the precipitated powder is there mentioned as suitable for internal administration. The natural article may, however, probably be preferred for the purpose now in view, for the precipitated, being more active, is less likely to reach the bowel unchanged. The natural kind can be rendered pure for medicinal use without alteration of its character; if no other but the precipitated is available, it could be rendered less speedily changeable by the simple process of ignition. Manganese dioxide may be conveniently administered alone in cachets or pills, the dose being varied, according to progress, between the limits above indicated.

## SCHOOLS AND EPIDEMICS.

THE Ministry of Health and the Board of Education have jointly issued a revised memorandum on the closure of schools and the exclusion of children from them.<sup>1</sup> The previous issue was in 1909. In an introductory note it is pointed out that hitherto local education authorities have been able to close schools during epidemics, not purely in public health interests, but for reasons of finance, so as to save loss of grant from diminished attendance. That statement amounts to a frank admission of mistaken policy on the part of the central authorities, and it is good that they have seen the wisdom of departing from it. The primary purpose of the school being education, it was wrong to make it possible for local bodies to profit financially by complete school closure rather than exclusion of pupils where the latter measure would be equally efficacious in checking spread of disease. The code now provides that closure shall take place only for medical reasons, and that authorities shall be secured from financial loss when schools are kept open with a greatly diminished attendance. Though in other respects the new memorandum does not differ essentially from that of 1909, attention is directed to certain changes and additions. These relate (1) to the rules as to periods of exclusion necessary for scarlet fever, diphtheria, measles, and mumps; (2) to rules for action in respect of small-pox, German measles, influenza, and epidemic diseases of the central nervous system, which have now increased in prevalence; (3) to action required where teachers are found suffering from pulmonary tuberculosis; and (4) an appendix giving in summary tabular form the incubation and exclusion periods of the commoner infectious diseases. After detailing the powers of local authorities, the memorandum goes on to give guidance for the co-ordination of the work of the school medical service with that of the public health service in respect of school closure, which is to be resorted to as seldom as possible, and the exclusion of children, which is very generally the more advisable course. The sanitary and educational authorities are the same in county boroughs and in some municipal boroughs and urban districts, so these may have the same officer for both purposes, who, it is advised, will generally find it more convenient to deal with closure and

<sup>1</sup> Copies may be obtained from H.M. Stationery Office or through any bookseller, price 4d. net.

exclusion as school medical officer, because, if the Board is satisfied with arrangements made locally, the officer can authorize exclusion directly, without reference to his authority, while, as already insisted, where he can only advise, not authorize, school closure should be rare and exceptional. Where there are two separate officers—one for education, the other for public health—the same considerations apply generally, though the responsibility of the latter officer for dealing with outbreaks of infectious disease is not diminished by the powers of the former, and definite working arrangements should be established on lines laid down in the memorandum. The collection of information about infectious disease among children will depend mainly on the medical organization of the local education authority, which can systematize the work of teachers, school nurses, and attendance officers, as well as get information from parents. Of these agencies that of well trained nurses is the best, by visits both to schools and to homes of absentees. Where the medical officer holds a joint appointment the information should go to him; elsewhere the health officer should be the first recipient, and transmit the information promptly to the school medical officer. Infection is spread much more by persons than by things, so that besides disinfection, cleanliness, and ventilation of school premises, special regard is to be given to children of infected households as possible carriers, and unrecognized cases may be sought for among children who have returned to school after a short absence. Exceptional conditions sometimes justifying school closure include infectious sickness in the teacher's family, the need for disinfection and cleansing after infected children have been in attendance, the rectification of sanitary defects; whilst in rural areas with scattered population the school may give the only likely opportunities for intercourse and so may be properly closed. Sometimes it suffices to close, not a whole school, but a department. An important section of the memorandum deals with rules for action in respect of particular diseases—scarlet fever, diphtheria, measles, and others—but the details are too numerous for synopsis here. Epidemic diseases of the central nervous system are referred to last of all, and though the guidance that present knowledge permits is limited in amount, yet what is said will no doubt be carefully studied. The whole memorandum will now be essential for reference by every health officer and school medical officer in the country. It is, moreover, well worth perusal by education authorities in general. It is signed by Sir George Newman on behalf of the Board of Education and the Minister of Health.

#### THE BACTERIOLOGY OF CANCER.

Some pathologists are reverting to the belief, once very generally held, that cancer is due to infection by some extraneous organism. On analogical grounds there is much to be said for this view, and investigations in this direction undoubtedly deserve encouragement. One of its chief exponents in this country is Dr. James Young of Edinburgh, who summed up the grounds on which he has arrived at this opinion in a paper recently published in our columns (January 10th, 1925, p. 60). He described an organism possessing a series of phases—yeast, coccal, bacillary, and amorphous—each of which could grow true to type and live a wholly independent life. He advanced evidence which satisfied him that the parasite lives in symbiosis with the cancer cell in the amorphous phase. The parasite, he said, belonged to familiar bacteria widespread in nature, and expressed the opinion that the ease with which cancer could be produced experimentally in animals by chronic irritation suggested that tissue susceptibility, which he also concluded must exist, implied an immediate risk of infection by a ubiquitous organism. Last year (June 21st, p. 1105) we gave some account of a

micro-organism isolated by Dr. T. J. Glover, formerly of Toronto, who claimed to have produced cancer in animals by its inoculation. He claimed also to have produced a serum with which he obtained favourable results. At that time Mr. R. J. Willan, who had then recently visited the United States, and to whom we were indebted for recent information, told us that he had heard of several successful cases, but was of the opinion, in which we concurred, that the claims made by Dr. Glover and his colleague Dr. Scott must be received with caution until a full disclosure was made. Dr. Loudon and Dr. James M. McCormack, physicians to St. Michael's Hospital, Toronto, published in a recent issue of the *Canada Lancet and Practitioner* (January, 1925) some observations they had made regarding the isolation, culture, and identification of the organism described by Dr. Glover. They had visited Dr. Glover's laboratory in New York, and had afterwards carried out a number of independent experiments and had cultivated an organism which they considered to be identical with that described by Glover. They insist upon its pleomorphism and recognize three distinct states of the life-cycle—bacillus, coccus, and spore sac. They also state that in one phase the virus passed through a Berkefeld filter, and that the filtrate yielded positive cultures when incubated at 37° C. for two days. They consider that their organism is identical with Glover's, and Dr. James Young informs us, in a letter recently received, that he considers that both are probably identical with his. He adds an expression of his belief that the cancer parasite can be understood properly only when considered in the light of recent work in bacterial variation, especially that of Löhnis and others. He concludes that a number of parasites may possess filterable, coccal, bacillary, hyphal, and yeast phases. He also calls attention to recent investigations by Blumenthal, Auler, and Meyer of Berlin, who have obtained<sup>1</sup> from different types of human malignant tumours a bacillus which they believe to be akin to the *Bacillus tumefaciens*, the cause of crown-gall in plants (Erwin Smith). By injecting this organism of human origin they have produced in the sunflower tumours indistinguishable from the typical crown-gall growth. Its injection into animals was followed in only two cases by a malignant growth at the site of inoculation. When accompanied by an irritant, however, employed for the purpose of preparing the tissues for the operation of the organism, malignant growths were produced at the site of inoculation in a considerable number of animals, and, in some, the microscopic malignancy was confirmed by the occurrence of metastases and by the fact that the tumours grew after transplantation to other animals of the same species.

#### TESTS OF PHYSICAL EFFICIENCY.

LIEUT.-COLONEL C. B. HEALD, M.D., medical adviser to the Department of Civil Aviation, Air Ministry, has visions of a newer medicine, in which the conventional methods of physical diagnosis will be scrapped. In the address which he delivered lately before the Royal Aeronautical Society he ventured to prophesy that we shall be able, by other than the conventional methods, to estimate with a high degree of scientific accuracy the physical well-being of any individual, to forecast where his barriers against possible disease are weak, and, by taking timely precautions, to strengthen them and so increase the chances of a prolonged and healthy life. It is through the science of aviation that this newer medicine will be realized, for it is presenting new problems in estimating physical efficiency, and teaching new facts regarding the mental and physical well-being of the individual. It is in words such as these that Dr. Heald concluded an address which throughout contained points of interest. He told his audience that the object of the

<sup>1</sup> *Zeits. f. Krebsforsch.*, xxi, 1924, p. 387.



medical test of a pilot is not so much the detection of disease as the estimation of his degree of well-being. While they enable the medical examiner to diagnose disease in its most preventable form, they also enable him to advise the pilot how he may retain his fitness or regain it if it is deteriorating. Like Oliver Wendell Holmes's one-hoss shay, the pilot breaks down but does not wear out. The medical tests detect the weak points in the machinery before the breakdown occurs. Centralization of the periodical medical examination of pilots, of apparatus and accommodation, and of a system of graphic and other records, is therefore essential, at any rate at present, for accurately comparing changes in physical efficiency. The tests as a whole are designed to assess the basic physical standard of the pilot, to estimate his ability in the air, and to indicate the effect of his ground life on his basic physical condition. Three of the tests—namely, the exercise tolerance test and the blood pressure and vital capacity measurements—are "habit detectors." Together they give useful information as regards the pilot's habits on the ground with reference to exercise and overindulgence in food, drink, and tobacco. Dr. Heald also described three new testing apparatus—the Tucker auditory testing apparatus for recording accurately the power of hearing, the heart recoil apparatus for testing the ability of the heart to withstand the strain of long flights in bad weather, and the Reid control apparatus for assessing the manner in which the delicate co-ordinated physical machinery involved in flight is likely to function. These new tests illustrate how air medicine is endeavouring to improve the technique of medical examinations, and appear, indeed, to have given Dr. Heald his visions of a newer medicine. In the course of his address he made some sound practicable suggestions for establishing confidence between employer, the pilot, the public, the insurance companies, and the Government in connexion with passenger traffic in the air, and also remarked on the difficulties of maintaining a high degree of sanitation in the passenger car, especially in connexion with ventilation and air-sickness. The provision of first-aid boxes in passenger machines and ambulance services in aerodromes was also touched upon.

#### THE CONTROL OF THE TSETSE FLY.

THOUGH *Glossina palpalis* is best known to the medical profession because it is the chief carrier of sleeping sickness, the cattle tsetse presents an even more formidable problem, owing to the vastness of the areas of which they effectually hamper the development. In *Nature* last week Mr. C. F. M. Swynnerton, in charge of tsetse work in Tanganyika Territory, described a scheme of control which had been inaugurated in Tanganyika Territory, and urged that, if the attack on the tsetse is to be made in the most economical and effective way, the main measures must lie in the diversion and regulation of agencies already in existence. The natives must be taught to understand and take part in the solution of their own problems, and existing agencies, such as the annual grass fires, must be harnessed. Tsetse flies are dependent on the presence of "bush." Certain native tribes have adopted a mode of settlement whereby, through the presence of sufficiently closely dotted villages with their chopping for firewood, building, and cultivation, and the browsing of their numerous stock, the bush is kept down and the "fly" excluded. By encouraging this form of settlement everywhere segregation will be extended and, for practical purposes, a control of the fly will be obtained. This concentration of organizable population, Mr. Swynnerton considers, is a necessary preliminary to all measures of a large nature against the tsetse in the bush; that is to say, reclamation must be undertaken. When one of these settlements comes into being its members should be helped to possess themselves of

cattle—for only cattle will "anchor" them permanently—and should be encouraged to push back the "fly" in conformity with their requirements. This will be done by an annual clearing of bush. The process has been begun in Shinyanga with the co-operation of the natives, and satisfactory results are already apparent. Clearing must be systematic, otherwise the stumps send out shoots and the position becomes worse than ever; methods of encouraging the removal of stumps and otherwise of killing woody growth are being experimented with. Increase in the population of the settlements should be encouraged by means of propaganda in hygiene, and the extension of the settlements be so guided that they would ultimately coalesce and cut off blocks of fly-infested bush, which, through their smaller size, could be attacked with more hope of success than the huge unbroken "fly-belt." Various methods could be applied to the blocks or smaller fly-belts. Swynnerton favours especially destruction of the thickets, which afford a breeding-place for most species of fly and a refuge for all during the annual grass fires; he would postpone the latter to the end of the dry season, when their lighting should be organized. Last year these organized fires drove the flies before them in great numbers into unburning thickets and patches of country burned previously, and it is suggested that in these places they could be exterminated merely by catching on a great scale. The fire also burned numbers of small breeding thickets, and killed, it appeared, many of the pupae of the flies. Father Cirvegna, a missionary, is believed to have cleared of fly a smaller area in three burnings. As regards game, the view is held that, while here and there the checking of particular movements of game animals may be necessary, no one wishes to exterminate the wonderful African fauna if the tsetse fly can be controlled otherwise, and that the initial work in Tanganyika leads to the very strong hope that it can. Swynnerton holds that knowledge of how to fight the tsetse can now best be advanced by taking a definite large area or entire territory and applying to it all knowledge that has been or will be acquired, by means of reclamation officers working hand in hand with research officers. These men would be trained in the field at the stations first established, and many would pass thence to other parts of Africa in order to make the campaign general. A large fund would be needed for this gradual development of large-scale experimentation in actual control under all African conditions; at the stage now reached that is the right method of research.

#### CHLORINE TREATMENT OF CERTAIN INFECTIONS.

THE use of chlorine in the treatment of respiratory disease has been studied by Lieut.-Colonel E. B. Vedder and Captain H. P. Sawyer, of the Medical Corps of the United States Army, and a few months ago we gave an account of their first report.<sup>1</sup> In a further report, recently published,<sup>2</sup> they produce a certain amount of additional evidence in support of the therapeutic value of the gas, and discuss at some length the mode in which it may be supposed to act. They state that of 85 cases of coryza treated by them during June, 1924, cure resulted in 60, 22 were improved, and there was no change in 3. In acute bronchitis 6 out of 9 patients were cured and 3 improved, while in acute laryngitis 2 out of 6 patients were cured and 4 improved. The remedy was less successful in chronic bronchitis and whooping-cough. In the former only 2 out of 12 patients were definitely cured, and in the latter 4 out of 21; the number improved in each case was 10. The authors now agree that sterility of the mucous surfaces following the therapeutic use of chlorine cannot be expected, though many bacteria are doubtless killed. They think, therefore, that the clinical improvement can be better explained as

<sup>1</sup> BRITISH MEDICAL JOURNAL, December 27th, 1924, p. 1206.

<sup>2</sup> Journ. Amer. Med. Assoc., January 31st, 1925, p. 361.

follows. The irritant action of chlorine stimulates the lymph flow and cleanses the mucous surfaces, destroying large numbers of organisms, some of which may even be brought up from the depths of glands and crypts. In whooping-cough the beneficial effect is attributed to the loosening of the masses of tenacious mucus, which are then expelled more readily. They state that irritants such as chlorine cause a primary brief capillary constriction, followed by protracted dilatation, which produces hyperaemia of the affected mucous membranes; this aids recovery by improving the blood supply and increasing the number of polymorphonuclear leucocytes. The best therapeutic results were given by a chlorine concentration between 0.009 and 0.015 mg. per litre. This must be maintained for one hour; failures follow any excursions outside these limits. An apparatus has been devised to deliver the proper concentration of chlorine constantly and automatically. The gas generated by the electrolysis of hydrochloric acid is mixed with air in a box and delivered at the rate of 10 to 12 cubic feet a minute. The patient breathes the mixture through a funnel-shaped bag of muslin, applied loosely to the nose and mouth; rebreathing into the bag is avoided. Chlorine rooms have been designed for use in large hospitals, and for the treatment of animals. The authors state definitely that hay fever, asthma, pneumonia, and tuberculosis have not been benefited by this treatment, and are to be regarded as contraindicating its use. A few patients showed unusual susceptibility to the gas, and in them the length of treatment was reduced. An infant of 3 months with whooping-cough made a good recovery after being treated on four separate days, and several patients aged from 75 to 85 with chronic bronchitis obtained considerable benefit. The authors believe that chlorine treatment will prove to have a prophylactic value, and that treatment of early cases of influenza, whooping-cough, or similar infections will result in preventing epidemics from occurring in regiments, schools, and industrial establishments. Benefit is reported also in distemper in dogs, and an epidemic of influenza in horses was cut short. So far, however, no confirmatory evidence of the value of chlorine treatment has been published by other investigators working on a large scale.

#### THE EDUCATIONAL VALUE OF THE SANITARY SURVEY.

THE second series of the Rockefeller Foundation's publication *Methods and Problems of Medical Education*,<sup>1</sup> issued by its Division of Medical Education under the direction of Dr. Richard M. Pearce, differs considerably from the first series, which was reviewed in our columns (1924, ii, 1014). Instead of dealing, as the opening number did, with several different subjects, this instalment confines its attention to the sanitary survey as an instrument of instruction in medical schools. Dr. Milton J. Rosenau, professor of preventive medicine and hygiene in the Harvard Medical School, Boston, discusses this problem in a comparatively short paper, and the rest of the volume is devoted to the sanitary survey of Rochester, New Hampshire, by Mr. Shields Warren when he was a third year's student in the Harvard Medical School. Professor Rosenau confines his remarks strictly to the use of the sanitary survey as a method of instruction in medical schools, and leaves entirely out of consideration for the time the teaching of preventive medicine, hygiene, and sanitation. To arouse interest is a basis of successful teaching, and the sanitary survey brings interest to a subject which the ordinary medical student regards as having but little bearing on his life's work. It was first used as a method of instruction in the School for Health Officers at Harvard, and met with such signal success that

it was introduced later into the course in preventive medicine and hygiene. Every student working for a medical degree is required to make a sanitary survey of some city or town, and submit a report containing (a) the collected data, (b) the interpretation of the facts, and (c) criticisms and recommendations. The student is told to regard the town that he is surveying just as he would a patient, but is not given any special instructions, since it is considered desirable to bring out powers of initiative, observation, and analysis. A small place is more suitable than a large one for such a sanitary service, and Boston is fortunate in having fifty-two towns within fifteen miles of the State House. All the Harvard medical students carry out these surveys, often in the vacations, and apparently the authorities of the surveyed towns sometimes come to recognize their deficiencies, and have employed the surveyors to organize a health service. The surveys are all filed in the Harvard Medical School. Mr. Shields Warren's survey of Rochester, New Hampshire, is reproduced without correction and with its photographs, graphs, and tables.

#### VITAMIN DEFICIENCY.

THE Royal Society of Medicine (as reported in our issue of February 21st, pp. 358-9) recently held a general meeting to consider the non-specific disturbances of health due to vitamin deficiency. The four opening papers were so full and so interesting that there was little or no time to discuss them. But so many present expressed the desire to debate the subject fully that the society is holding a further meeting on Monday, March 23rd, at 5.30 p.m. The subject will again be opened by Dr. Leonard Williams, Colonel Robert McCarrison, Dr. W. Cramer, and Dr. G. M. Findlay, with an epitome of their opening speeches and lantern demonstrations. But the original speeches can be read in full in the March number of the society's *Proceedings*, and those who wish for a summary can obtain galley slips on application at the society's office, 1, Wimpole Street, W.1. The general discussion of these papers will be opened by Dr. William Hunter and Dr. Robert Hutchison.

#### VENEREAL DISEASE: DEPUTATION TO THE MINISTER OF HEALTH.

LAST week the Minister of Health, who was attended by the Chief Medical Officer, the Secretary of the Department, and other technical advisers, received a joint deputation from the National Council for Combating Venereal Diseases and the Society for the Prevention of Venereal Disease. In the absence of Lord Trevethin, president of the National Council, the deputation was introduced by Sir Auckland Geddes, G.C.M.G., M.D., president of the Society, acting on behalf of both bodies. Sir Auckland Geddes stated the case on the lines agreed by the joint conference of the two societies, and supported the recommendation contained in Clause 14 of the Trevethin report: "That the law should be altered so as to permit properly qualified chemists to sell *ad hoc* disinfectants, provided such disinfectants are sold in a form approved and with instructions for use approved by some competent authority." Sir Auckland Geddes further urged on behalf of the deputation that this competent authority preferably should be the Ministry of Health, otherwise the Medical Research Council or a commission of experts. In reply, Mr. Neville Chamberlain promised to consider carefully the suggestions which had been made, and to communicate the result of his further consideration as soon as possible.

WE regret to announce the death of Dr. John Cleland, F.R.S., Emeritus Professor of Anatomy in the University of Glasgow, in his ninetieth year. We hope to publish a memoir in an early issue.

<sup>1</sup> *Methods and Problems of Medical Education*. Second series. The Sanitary Survey as an Instrument of Instruction in Medical Schools. New York, 1924.